(No Model.)

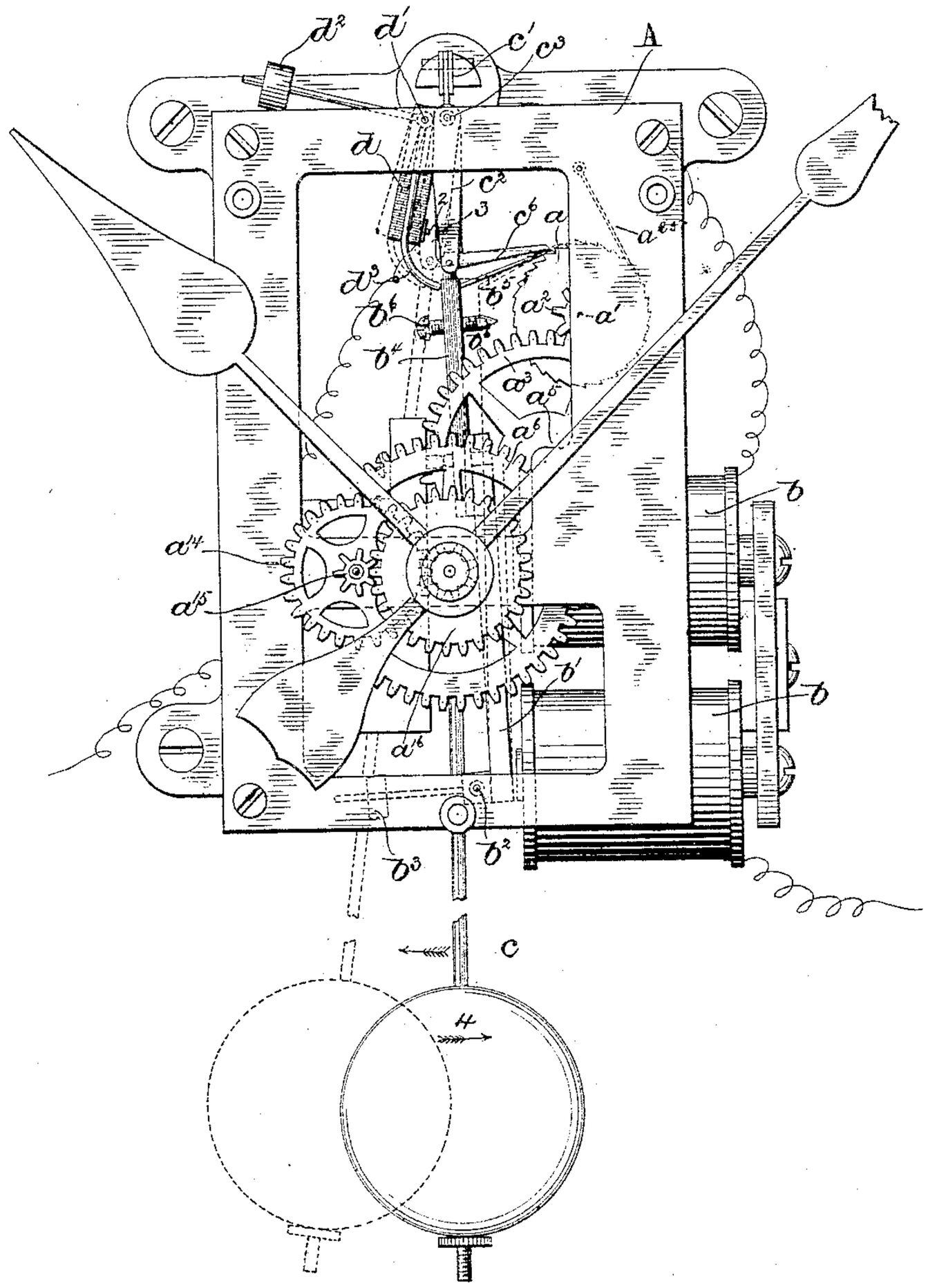
2 Sheets—Sheet 1.

W. S. SCALES.

INDEPENDENT ELECTRIC CLOCK.

No. 448,998. Patented Mar. 24, 1891.

Fig. 1.



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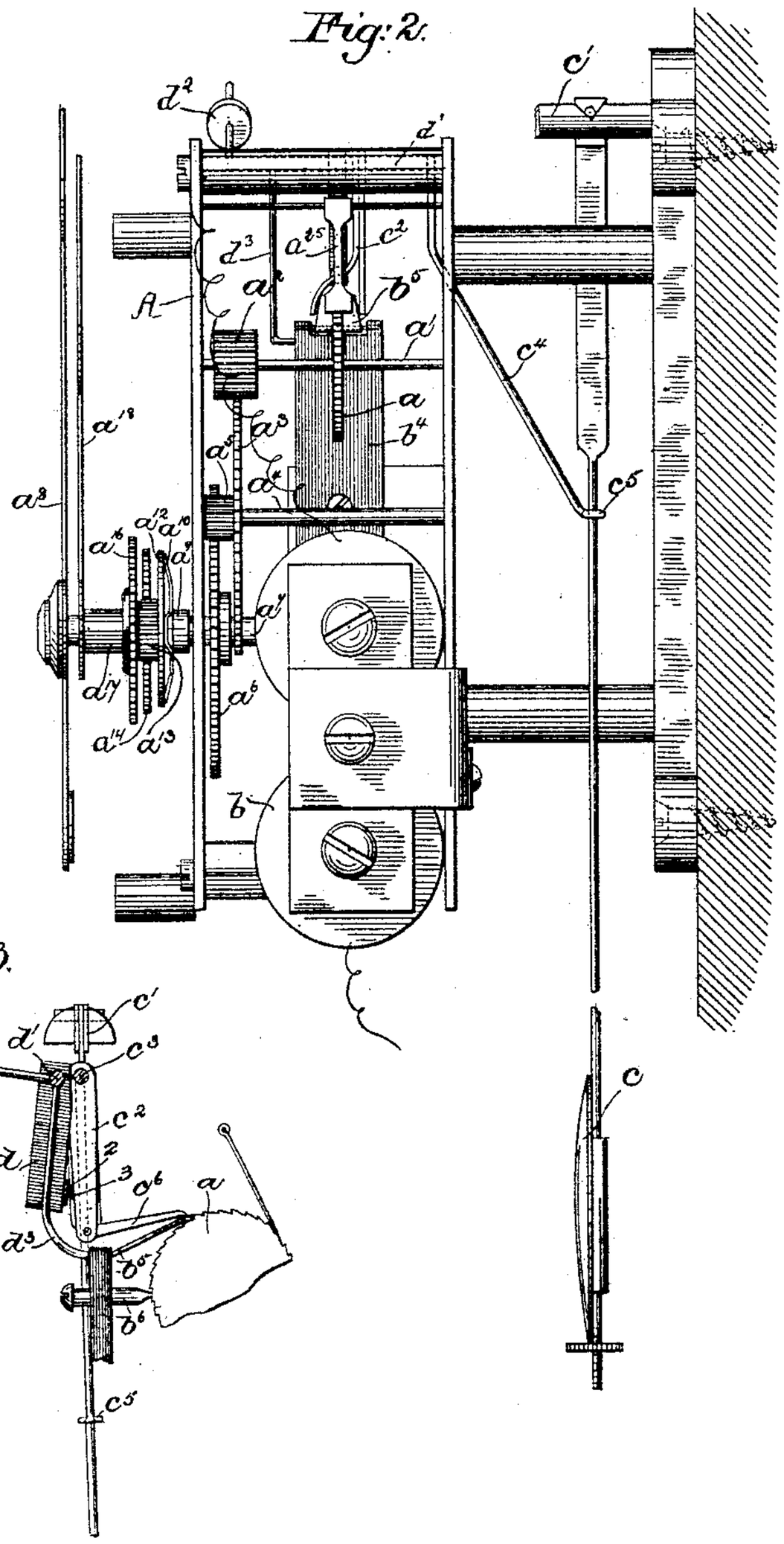
(No Model.) 2 Sheets—Sheet 2.

W. S. SCALES.

INDEPENDENT ELECTRIC CLOCK.

No. 448,998. Patented Mar. 24, 1891.

Fig: 2.



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UNITED STATES PATENT OFFICE.

WILLIAM S. SCALES, OF EVERETT, ASSIGNOR OF TWO-THIRDS TO JOSEPH H. CLARK, OF QUINCY, AND JOHN B. HUMPHREY, OF BOSTON, MASSACHUSETTS.

INDEPENDENT ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 448,998, dated March 24, 1891.

Application filed July 19, 1890. Serial No. 359,304. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. SCALES, of Everett, county of Middlesex, State of Massachusetts, have invented an Improvement in Electric Clocks, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object to improve the construction of electric clocks.

The invention consists in the combination, with a clock-train, a step-by-step driving mechanism therefor, and an electro-magnet and its armature that actuates said driving mechanism, of a regulating member for said clock which actuates said driving mechanism in case the armature of the electro-magnet fails; also, in an electric clock, a train, a step-by-step driving mechanism therefor, an electro-magnet and its armature that actuates said driving mechanism, and a regulating member for the train which actuates said driving mechanism in case the armature fails, combined with a propeller for said regulating member and a circuit-closer for the electro-magnet, moved in one direction by the regulating member and in the other direction by the armature.

The train may be of any suitable construction, and for the step-by-step driving mechanism I shall prefer to employ a ratchet-wheel secured to one of the shafts of the train and means for pushing it ahead step by step, actuated by the armature of the electro-magnet; but it has been found unreliable to depend entirely on the said armature for the accomplishment of this result, as occasionally said armature fails to respond to the impulses or to move sufficiently to in turn move the ratchet-wheel; and hence I have so constructed the parts that the pendulum or other regulating member of the clock will effect this result in case the armature fails. A propeller is provided for the pendulum, which is located in juxtaposition to the armature, or it may be the armature-lever, so as to be struck and moved by said lever a short distance as it is retracted to accumulate a certain amount of power which is to be expended in giving an impetus to the pendulum. The circuit of the electro-magnet is opened and closed by a circuit-closer which is closed by the pendulum when moved in one direction and which is broken during the return movement of the pendulum.

It is designed that the retractile force of the armature shall be sufficient to move the pendulum-propeller from its normal position of rest a short distance to thereby accumulate a certain amount of force, and that the pendulum when moving in one direction will close the circuit of the electro-magnet and at or about the same time will engage the propeller, so that the armature will be at once attracted and will no longer hold the propeller and the accumulated force thereof will be given to the pendulum, and also that as the pendulum returns or moves in the opposite direction it will leave the propeller in its normal position of rest and at or about the same time will open the circuit so that the armature retracting will again move the propeller from its normal position of rest a short distance to again accumulate a force which is to be expended on the pendulum.

Figure 1 shows in front elevation an electric clock embodying this invention; Fig. 2, a side view of the clock shown in Fig. 1; and Fig. 3, a detail showing a portion of the pendulum, the step-by-step driving mechanism, propeller for the pendulum, and circuit-closer.

The main frame-work A of the clock may be of any suitable or usual construction to support the operating parts. The driving-train consists of a ratchet toothed wheel a, secured to a shaft a', bearing a pinion a^2, which meshes with a toothed wheel a^3, secured to a shaft a^4, carrying a pinion a^5, which engages a toothed wheel a^6, secured to a shaft a^7, carrying the minute-hand a^8. A sleeve a^9 is mounted on the shaft a^7, which carries a friction-plate a^{10}, engaging a disk a^{12}, having secured to it a pinion a^{13}, which engages a toothed wheel a^{14}, secured to a shaft carrying a pinion a^{15}, which engages a toothed wheel a^{16}, secured to a sleeve a^{17}, to which is attached the hour-hand a^{18}. A back-stop or click a^{25} is secured to the frame which is in engagement with the ratchet-wheel a to prevent retrograde movement thereof. In lieu of this particular form of train any other suitable construction or arrangement may be

employed. An electro-magnet *b* (see Fig. 1) is employed, the armature *b'* of which is pivoted at b^2, and is provided with a retractile weight b^3, or it may be a spring; but for delicate adjustment I prefer to employ a weight. The armature, as herein represented, has secured to it a short arm b^4, having at its upper end a pawl b^5, which engages the ratchet toothed wheel *a* to drive the train. The arm b^4 has a suitable limiting stop b^6 of any suitable kind to limit the attractive movement of the armature.

The regulator herein represented consists of a pendulum *c* of any usual or suitable construction suspended from a short arm or bar *c'*, secured to the frame-work. A pawl-carrying block or arm c^2 is secured to a rod or shaft c^3, to which is attached an arm c^4, having a bifurcated end c^5, which engages the pendulum-rod *c*, so that as the pendulum swings to and fro the pawl-carrying arm c^2 will be moved simultaneously with it. The pawl-carrying arm c^2, as herein represented, consists of two pieces of metal secured together and separated at their lower ends, at which point a cross bar or pin is secured, which carries a pawl c^6, which is adapted to engage the ratchet-wheel *a* on the shaft *a'*, and, as herein represented, it rests by gravity on the upper side of the pawl b^5, and is designed to move the said ratchet forward one tooth, providing the pawl b^5 fails to operate, as it is designed that they both shall operate independently and successively on the same tooth at each movement.

A propeller is provided for the pendulum, it compensating for the loss by friction and impediments, said propeller being herein shown as a block *d*, pivoted at *d'* to the frame-work and carrying a suitable weight d^2, preferably adjustable. The propeller has at its lower end a bent arm d^3, which is adapted to bear against the upper end of the arm d^4 on the armature; or it may be the armature itself.

A circuit-closer is provided for the electro-magnet *b*, one member of which, as 2, is carried by the propeller, it being arranged on block *d*, and the other member of which, as 3, is carried by the pawl-carrying arm c^2; or it may be on the pendulum rod direct.

The clock is started by giving proper movement to the pendulum, and with the pendulum in its position of rest the parts will be represented as in Fig. 1. As the pendulum is swung in the direction of the arrow, or toward the left, the pawl-carrying arm c^2 will be moved until the contact 3 closes on the contact 2, and by the inertia given to it will lift the said propeller a short distance toward the left. The moment the contacts 2 3 close the electro-magnet *b* is energized and its armature is attracted, the pawl b^5 moving the ratchet-wheel *a* forward one tooth, and at the same time relieving the propeller of the weight or pressure of the retractile force of the armature. The pendulum *c* then swings in the opposite direction, as indicated by the arrow 4 thereon, and is assisted in such movement by the weight of the propeller bearing on the pawl-carrying arm, and said propeller continues to bear on said arm and assist the pendulum in its movement until the bent arm d^3 strikes the upper end of the arm b^4, when its movement is checked and the pendulum continues its movement unassisted. The moment the propeller is thus stopped the pendulum moving on causes the contact 3 to separate from the contact 2, thereby opening the circuit and permitting the armature *b* to retract.

The retractive force of the armature is greater than the weight of the propeller, and hence carries the propeller back with it into the full-line position, (shown in Fig. 1,) there holding it until the pendulum returns again, engages the propeller in the manner first described, and closes the circuit. Hence it will be seen that by means of the retractive force of the armature the propeller is lifted to accumulate a force which is expended on the pendulum, and, furthermore, that the armature of the ratchet-wheel is moved by the electro-magnet; but if the armature should occasionally fail to respond for one or more impulses the pendulum, swinging by its own momentum, will operate said ratchet-wheel and prevent loss of registration of time, it being understood, however, that should the electro-magnet permanently fail the pendulum itself will not, however, drive the train but a very short time.

I claim—

1. In an electric clock, a step-by-step train, a driving-pawl, and an electro-magnet and its armature that moves said driving-pawl, a pendulum or equivalent and driving-pawl moved by it, a propeller, and a circuit-closer, substantially as described.

2. In an electric clock, a train, a driving-pawl, and electro-magnet and its armature that moves said driving-pawl, a pendulum, a propeller therefor located in juxtaposition to the armature and pendulum to be moved by the former to accumulate a force which is given to the latter, and a circuit-closer for the circuit of said electro-magnet, one of the members of which is carried by the pendulum and the other by the propeller, and the driving-pawl also moved by said pendulum, substantially as described.

3. In an electric clock, a train, a step-by-step driving mechanism therefor, and an electro-magnet and its armature that controls the operation of said driving mechanism, combined with a regulating member for the clock that also controls the operation of said driving mechanism independent of the electro-magnet, substantially as described.

4. In an electric clock, a train, a step-by-step driving mechanism therefor, and an electro-magnet and its armature that actuates said driving mechanism, combined with a regulating member for the train which actuates said driving mechanism in case the armature

of the electro-magnet fails, substantially as described.

5. In an electric clock, a train, a step-by-step driving mechanism therefor, an electro-magnet and its armature that actuates said driving mechanism, and a regulating member for the train which actuates said driving mechanism in case the armature fails, combined with a propeller for said regulating member, and a circuit-closer for the electro-magnet moved in one direction by the regulating member and in the other direction by the armature, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM S. SCALES.

Witnesses:

BERNICE J. NOYES,

AUGUSTA E. DEAN.